

**LISTING OF CLAIMS**

1. **(withdrawn from consideration)** A spinal rod system for bridging one or more adjacent vertebrae, said system comprising

a first fastener fixed to a first vertebra;

a second fastener fixed to a second vertebra;

a rod extending at least between said first and second fasteners;

a rod retention assembly associated with each fastener for retaining said rod relative to each respective fastener;

each said rod retention assembly comprising a cup having an open top end and an open bottom end; said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow a portion of said respective fastener to pass through while retaining another portion of said fastener in said cup;

said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall;

said generally cylindrical wall having an interior cylindrical wall surface that tapers generally outwardly in a downward direction from said uppermost portion;

a cap associated with each cup being generally cylindrically shaped and having a pair of diametrically opposed tapered outer surfaces that taper radially outwardly, and having a pair of wing portions extending radially outwardly, said pair of wings further comprising vertically extending end surfaces; whereby with respect to each cup, said rod is received in each of said slots and said cap is positioned in said cup above said rod in a manner in which said tapered surfaces contact said interior wall surfaces and said vertically extending surfaces contact the outer surface of said generally cylindrical walls.

2. **(withdrawn from consideration)** A system according to claim 1, further comprising

a screw associated with each cap and adapted to be inserted through a screw hole in said cap and further adapted to be tightened to apply pressure to said rod in order to lock said rod relative to said cup.

3. **(withdrawn from consideration)** A system according to claim 2, wherein each said fastener is adapted to be locked with respect to its associated cup by progressive tightening of said respective screw.
4. **(withdrawn from consideration)** A system according to claim 1, wherein each said fastener is a screw having a head of a diameter greater than the diameter of said bottom opening, and having a threaded shaft of a diameter less than the diameter of said bottom opening.
5. **(withdrawn from consideration)** A system according to claim 4, wherein the lower portion of said screw head is generally hemispherically shaped.
6. **(withdrawn from consideration)** A system according to claim 1, further comprising  
a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening.
7. **(withdrawn from consideration)** A system according to claim 5, further comprising  
a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening, wherein said lower portion of said screw head rests on said conical surface in a manner in which said threaded shaft may be adjusted in angular orientation relative to said cup.
8. **(withdrawn from consideration)** A system according to claim 7, further comprising

a seat spacer adapted to rest on top of each said fastener head and to be positioned beneath said rod, thereby supporting said rod relative to said fastener.

9. **(withdrawn from consideration)** A system according to claim 8, wherein the top surface of each said fastener head is generally dome-shaped and each said seat spacer has a complementary contact surface that contacts said top surface of said respective fastener head in a manner permitting angular adjustment of said respective fastener relative to said seat spacer.

10. **(withdrawn from consideration)** A system according to claim 1, further comprising  
a sleeve ring associated with each cup adapted to be positioned in said cup adjacent to said bottom opening and further adapted to support said associated fastener in said cup.

11. **(withdrawn from consideration)** A spinal rod system for bridging one or more adjacent vertebrae, said system comprising

- a first fastener fixed to a first vertebra;
- a second fastener fixed to a second vertebra;
- a rod extending at least between said first and second fasteners;
- a rod retention assembly associated with each fastener for retaining said rod relative to each respective fastener;

each said rod retention assembly comprising a cup having an open top end and an open bottom end; said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow said respective fastener to pass through;

a sleeve ring associated with each cup adapted to be positioned in said cup adjacent to said bottom opening and further adapted to support said associated fastener in said cup, whereby the inner diameter of said ring is large enough to allow a portion of said fastener to pass therethrough while retaining another portion of said fastener in said cup;

said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall;

said generally cylindrical wall having an interior cylindrical wall surface that tapers generally outwardly in a downward direction from said uppermost portion;

a cap associated with each cup being generally cylindrically shaped and having a pair of diametrically opposed tapered outer surfaces that taper radially outwardly, and having a pair of wing portions extending radially outwardly, said pair of wings further comprising vertically extending end surfaces;

whereby with respect to each cup, said rod is received in each of said slots and said cap is positioned in said cup above said rod in a manner in which said tapered surfaces contact said interior wall surfaces and said vertically extending surfaces contact the outer surface of said generally cylindrical walls.

12. **(withdrawn from consideration)** A system according to claim 11, further comprising

a screw associated with each cap and adapted to be inserted through a screw hole in said cap and further adapted to be tightened to apply pressure to said rod in order to lock said rod relative to said cup.

13. **(withdrawn from consideration)** A system according to claim 12, wherein each said fastener is adapted to be locked with respect to its associated cup by progressive tightening of said respective screw.

14. **(withdrawn from consideration)** A system according to claim 11, wherein each said fastener is a screw having a head of a diameter greater than the inner diameter of said sleeve ring, and having a threaded shaft of a diameter less than the inner diameter of said sleeve ring.

15. **(withdrawn from consideration)** A system according to claim 14, wherein the lower portion of said screw head is generally hemispherically shaped.

16. **(withdrawn from consideration)** A system according to claim 11, further comprising

a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening.

17. **(withdrawn from consideration)** A system according to claim 15, further comprising

a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening, wherein said sleeve ring rests on said conical surface and said lower portion of said screw head rests on said sleeve ring in a manner in which said threaded shaft may be adjusted in angular orientation relative to said cup.

18. **(withdrawn from consideration)** A system according to claim 17, further comprising

a seat spacer adapted to rest on top of each said fastener head and to be positioned beneath said rod, thereby supporting said rod relative to said fastener.

19. **(withdrawn from consideration)** A system according to claim 18, wherein

the top surface of each said fastener head is generally dome-shaped and each said seat spacer has a complementary contact surface that contacts said top surface of said respective fastener head in a manner permitting angular adjustment of said respective fastener relative to said seat spacer.

20. **(withdrawn from consideration)** A spinal rod system for bridging one or more adjacent vertebrae, said system comprising

a first fastener fixed to a first vertebra;

a second fastener fixed to a second vertebra; a rod extending at least between said first and second fasteners;

a rod retention assembly associated with each fastener for retaining said rod relative to each respective fastener;

each said rod retention assembly comprising a cup having an open top end and being fixed to said respective fastener at a bottom end,

said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall;

said generally cylindrical wall having an interior cylindrical wall surface that tapers generally outwardly in a downward direction from said uppermost portion;

a cap associated with each cup being generally cylindrically shaped and having a pair of diametrically opposed tapered outer surfaces that taper radially outwardly, and having a pair of wing portions extending radially outwardly, said pair of wings further comprising vertically extending end surfaces;

whereby with respect to each cup, said rod is received in each of said slots and said cap is positioned in said cup above said rod in a manner in which said tapered surfaces contact said interior wall surfaces and said vertically extending surfaces contact the outer surface of said generally cylindrical walls.

21. **(withdrawn from consideration)** A system according to claim 20, further comprising

a screw associated with each cap and adapted to be inserted through a screw hole in said cap and further adapted to be tightened to apply pressure to said rod in order to lock said rod relative to said cup.

22. **(withdrawn from consideration)** A system according to claim 21, wherein each said fastener is adapted to be locked with respect to its associated cup by progressive tightening of said respective screw.

23. **(withdrawn from consideration)** A method of installing a spinal rod system for bridging one or more adjacent vertebrae, said method comprising

inserting a first fastener into a first rod retention cup;

inserting a second fastener into a second rod retention cup;

installing said first fastener into a first vertebra;

installing said second fastener into a second vertebra;

positioning a rod into each of said first and second retention cups so that said rod extends at least between said first and second fasteners;

wherein each said rod retention cup has an open top end and an open bottom end, and said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow a portion of said respective fastener to pass through while retaining another portion of said fastener in said cup, and said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall, said generally cylindrical wall having an interior cylindrical wall surface that tapers generally outwardly in a downward direction from said uppermost portion; and

installing a cap into each cup above said rod, each said cap being generally cylindrically shaped and having a pair of diametrically opposed tapered outer surfaces that taper radially outwardly, and having a pair of wing portions extending radially outwardly, said pair of wings further comprising vertically extending end surfaces, and said tapered surfaces contact said interior wall surfaces and said vertically extending surfaces contact the outer surface of said generally cylindrical walls.

24. **(withdrawn from consideration)** A method according to claim 23, further comprising

advancing a screw positioned in each cap through a screw hole in said cap in a manner in which said screw is tightened against said rod to apply pressure to said rod in order to lock said rod relative to said cup.

25. **(withdrawn from consideration)** A method of installing a spinal rod system for bridging one or more adjacent vertebrae, said method comprising

inserting a first sleeve ring into a first rod retention cup;

inserting a second sleeve ring into a second rod retention cup

inserting a first fastener into said first rod retention cup such that a portion of said first fastener rests on said first sleeve ring within said first cup and another portion of said first fastener extends through said first sleeve ring and out of said first cup;

inserting a second fastener into a second rod retention cup such that a portion of said second fastener rests on said second sleeve ring within said second cup and another portion of said second fastener extends through said second ring and out of said second cup;

installing said first fastener into a first vertebra;

installing said second fastener into a second vertebra; positioning a rod into each of said first and second retention cups so that said rod extends at least between said first and second fasteners;

wherein each said rod retention cup has an open top end and an open bottom end, and said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow a portion of said respective fastener to pass through while retaining another portion of said fastener in said cup, and said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall, said generally cylindrical wall having an interior cylindrical wall surface that tapers generally outwardly in a downward direction from said uppermost portion; and

installing a cap into each cup above said rod, each said cap being generally cylindrically shaped and having a pair of diametrically opposed tapered outer surfaces that taper radially outwardly, and having a pair of wing portions extending radially outwardly, said pair of wings further comprising vertically extending end surfaces, and said tapered surfaces contact said interior wall surfaces and said vertically extending surfaces contact the outer surface of said generally cylindrical walls.

26. **(withdrawn from consideration)** A method according to claim 25, further comprising



advancing a screw positioned in each cap through a screw hole in said cap in a manner in which said screw is tightened against said rod to apply pressure to said rod in order to lock said rod relative to said cup.

Claims 27-29.       **(cancelled)**

30.   **(currently amended)** A system according to claim 27, further comprising spinal rod system for bridging one or more adjacent vertebrae, said system comprising:

a first fastener fixed to a first vertebra;

a second fastener fixed to a second vertebra;

a rod extending at least between said first and second fasteners;

a rod retention assembly associated with each fastener for retaining said rod relative to each respective fastener;

each said rod retention assembly comprising a cup having an open top end and an open bottom end;

said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow a portion of said respective fastener to pass through while retaining another portion of said fastener in said cup;

said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall;

said generally cylindrical wall having an interior cylindrical wall surface with at least two inverted shoulders, each inverted shoulder having a contact surface that is inclined in a direction radially outwardly from a center axis of said cup;

a cap associated with each cup being generally cylindrically shaped and having at least two shoulders extending radially outward and each having a shoulder with a contact surface that is inclined in a direction radially outwardly from a center of said cap; and

a sleeve ring associated with each cup adapted to be positioned in said cup adjacent to said bottom opening and further adapted to support said associated fastener in said cup,

whereby with respect to each cup, said rod is received in each of said slots and said cap is positioned in said cup above said rod in a manner in which said respective contact surfaces of said cup and said cap contact each other.

31. **(original)** A system according to claim 30, further comprising

a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening, wherein said sleeve ring is positioned against said conical surface between said cup and said fastener in a manner in which said fastener is supported entirely by said sleeve ring. a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening, wherein said lower portion of said screw head rests on said conical surface in a manner in which said threaded shaft may be adjusted in angular orientation relative to said cup.

Claims 32-33. **(cancelled)**

34. **(currently amended)** A system for bridging one or more adjacent vertebrae, said system comprising

a first fastener adapted to be fixed to a first vertebra;

a second fastener adapted to be fixed to a second vertebra;

a rod extending at least between said first and second fasteners;

a rod retention assembly associated with each fastener for retaining said rod relative to each respective fastener;

each said rod retention assembly comprising a cup having an open top end and an open bottom end;

said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow said respective fastener to pass through;

a sleeve ring associated with each cup adapted to be positioned in said cup adjacent to said bottom opening and further adapted to support said associated fastener in said cup, whereby the inner diameter of said ring is large enough to allow a portion of said fastener to pass therethrough while retaining another portion of said fastener in said cup;

said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall;

said generally cylindrical wall having an interior cylindrical wall surface with at least two inverted shoulders, each inverted shoulder having a contact surface that is inclined in a direction radially outwardly from a center axis of said cup;

a cap associated with each cup being generally cylindrically shaped and having at least two shoulders extending radially outward and each having a shoulder with a contact surface that is inclined in a direction radially outwardly from a center of said cap, whereby with respect to each cup, said rod is received in each of said slots and said cap is positioned in said cup above said rod in a manner in which said respective contact surfaces of said cup and said cap contact each other.

35. **(original)** A system according to claim 34, further comprising a screw associated with each cap and adapted to be inserted through a screw hole in said cap and further adapted to be tightened to apply pressure to said rod in order to lock said rod relative to said cup.

36. **(original)** A system according to claim 35, wherein each said fastener is adapted to be locked with respect to its associated cup by progressive tightening of said respective screw.

37. **(original)** A system according to claim 34, wherein each said fastener is a screw having a head of a diameter greater than the inner diameter of said sleeve ring, and having a threaded shaft of a diameter less than the inner diameter of said sleeve ring.

38. **(original)** A system according to claim 37, wherein the lower portion of said screw head is generally hemispherically shaped.
39. **(original)** A system according to claim 34, further comprising a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening.
40. **(original)** A system according to claim 38, further comprising a generally, inwardly tapered conical surface formed on the interior of said cup and surrounding said bottom opening, wherein said sleeve ring rests on said conical surface and said lower portion of said screw head rests on said sleeve ring in a manner in which said threaded shaft may be adjusted in angular orientation relative to said cup.
41. **(original)** A system according to claim 40, further comprising a seat spacer adapted to rest on top of each said fastener head and to be positioned beneath said rod, thereby supporting said rod relative to said fastener.
42. **(original)** A system according to claim 41, wherein the top surface of each said fastener head is generally dome-shaped and each said seat spacer has a complementary contact surface that contacts said top surface of said respective fastener head in a manner permitting angular adjustment of said respective fastener relative to said seat spacer.
43. **(withdrawn from consideration)** A method of installing a spinal rod system for bridging one or more adjacent vertebrae, said method comprising  
inserting a first fastener into a first rod retention cup;  
inserting a second fastener into a second rod retention cup;  
installing said first fastener into a first vertebra;  
installing said second fastener into a second vertebra;  
positioning a rod into each of said first and second retention cups so that said rod extends at least between said first and second fasteners;

wherein each said rod retention cup has an open top end and an open bottom end, and said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow a portion of said respective fastener to pass through while retaining another portion of said fastener in said cup, and said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall, said generally cylindrical wall having an interior cylindrical wall surface with at least two inverted shoulders that each taper generally outwardly in an upward direction; and

installing a cap into each cup above said rod, each said cap being generally cylindrically shaped and having a pair of shoulders extending radially outwardly and in an upward direction, and said shoulders contact said inverted shoulders.

44. **(withdrawn from consideration)** A method according to claim 43, further comprising advancing a screw positioned in each cap through a screw hole in said cap in a manner in which said screw is tightened against said rod to apply pressure to said rod in order to lock said rod relative to said cup.

45. **(withdrawn from consideration)** A method according to claim 43, further comprising advancing a screw positioned in each cap through a screw hole in said cap in a manner in which said screw is tightened against said rod to apply pressure to said rod in order to lock said rod relative to said cup, and in order to draw said shoulders and said inverted shoulders into each other in a manner causing said generally cylindrical wall to be biased inwardly.

46. **(withdrawn from consideration)** A method of installing a spinal rod system for bridging one or more adjacent vertebrae, said method comprising inserting a first sleeve ring into a first rod retention cup, inserting a second sleeve ring into a second rod retention cup inserting a first fastener into said first rod retention cup such that a portion of said first fastener rests on said first sleeve ring within said first cup and another portion of said first fastener extends through said first sleeve ring and out of said first

cup; inserting a second fastener into a second rod retention cup such that a portion of said second fastener rests on said second sleeve ring within said second cup and another portion of said second fastener extends through said second ring and out of said second cup; installing said first fastener into a first vertebra; installing said second fastener into a second vertebra; positioning a rod into each of said first and second retention cups so that said rod extends at least between said first and second fasteners; wherein each said rod retention cup has an open top end and an open bottom end, and said bottom end of said cup having a generally circular hole forming a bottom opening, said bottom opening being sized large enough to allow a portion of said respective fastener to pass through while retaining another portion of said fastener in said cup, and said top end of said cup having a top opening and a generally cylindrical wall defining said top opening, said wall having at least two slots diametrically opposed to each other and extending downwardly from the uppermost portion of said wall, said generally cylindrical wall having an interior cylindrical wall surface with at least two inverted shoulders that each taper generally outwardly in an upward direction; and installing a cap into each cup above said rod, each said cap being generally cylindrically shaped and having a pair of shoulders extending radially outwardly and in an upward direction, and said shoulders contact said inverted shoulders.

47. **(withdrawn from consideration)** A method according to claim 46, further comprising advancing a screw positioned in each cap through a screw hole in said cap in a manner in which said screw is tightened against said rod to apply pressure to said rod in order to lock said rod relative to said cup.

48. **(withdrawn from consideration)** A method according to claim 46, further comprising; advancing a screw positioned in each cap through a screw hole in said cap in a manner in which said screw is tightened against said rod to apply pressure to said rod in order to lock said rod relative to said cup, and in order to draw said shoulders and said inverted shoulders into each other in a manner causing said generally cylindrical wall to be biased inwardly.

49. **(withdrawn from consideration)** A support ring for use in a pedicle screw system, said ring comprising a split-ring body adapted to be received in a cup-shaped spinal rod and pedicle screw retainer, said body being adapted to rest on top of a pedicle screw head and to support said rod thereon.

50. **(withdrawn from consideration)** A ring according to claim 49, wherein said body is resilient and is adapted to engage an inner circumferential surface of said retainer.

51. **(withdrawn from consideration)** A ring according to claim 50, wherein said body is adapted to be positioned in a groove on said inner circumferential surface.

52. **(withdrawn from consideration)** A ring according to claim 49, wherein said head and said ring are relatively sized such that said ring is fit around said head.

53. **(withdrawn from consideration)** A ring according to claim 52, wherein said ring is resiliently expanded when fit around said head.

54. **(withdrawn from consideration)** A seat sleeve for use in a pedicle screw system, said sleeve comprising a generally ring-shaped body having an inner surface and an outer surface, wherein said outer surface is adapted to engage the inner diameter of a cup-shaped spinal rod and pedicle screw retainer, and said inner surface is adapted to support a bone screw suspended therefrom.

55. **(withdrawn from consideration)** A sleeve according to claim 54, wherein said outer surface engages said inner diameter near a bottom opening of said retainer.

56. **(withdrawn from consideration)** A sleeve according to claim 54, wherein the outer diameter of said outer surface varies in a vertical direction.

57. **(withdrawn from consideration)** A sleeve according to claim 54, wherein the inner diameter of said inner surface varies in a vertical direction.

58. **(withdrawn from consideration)** A sleeve according to claim 54, wherein said outer surface is tapered.

59. **(withdrawn from consideration)** A sleeve according to claim 54, wherein said inner surface is tapered.

60. **(withdrawn from consideration)** A sleeve according to claim 54, wherein a vertical height dimension of said sleeve is greater than the difference between an outer diameter of said sleeve and an inner diameter of said sleeve.

Claims 61-67. **(cancelled)** -